

**OFFICE OF WATER QUALITY  
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
ASSESSMENT BRANCH  
Environmental Toxicology and Chemistry Section**

**INFORMATIONAL PAGE**

**IDEM Document Control Number:** IDEM/100/29/358/002/2001

**Date:** March 2, 2001

**Title:** The Crawford Ditch Assessment Report 2001

**Sample Matrix:** Water ( X ); Sediment (   ); Fish Tissue (   )

**Location:** Lake Michigan Basin

**Hydrologic Unit Code:** 04050001

**Section:** Environmental Toxicology and Chemistry Section

**Author and Title:** Julie Buening, Environmental Scientist III

**Abstract or Summary:** The purpose of this study is to assess the water quality of Crawford Ditch for dissolved copper and oil & grease. Crawford Ditch is on the 303 (d) list of impaired waterbodies for copper and oil & grease. The dissolved copper results from three sampling events showed no water quality standard (WQS) violations. Two of the three sampling events for the oil & grease results are rejected for data quality reasons; however, the results from one sampling event showed no WQS violations for oil & grease. The recommendations for Crawford Ditch were to delist the stream for the dissolved copper parameter and to resample Crawford Ditch for the oil & grease parameter.

**Keywords:** TMDL, Crawford Ditch, Dissolved Copper, Oil & Grease

**Availability:** Hard Copy and electronic format

**OFFICE OF WATER QUALITY  
INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
ASSESSMENT BRANCH  
Environmental Toxicology and Chemistry Section**

**AUTHORIZATION FOR PRINTING AND DISTRIBUTION  
SIGNATORY PAGE**

**IDEM DOCUMENT CONTROL NUMBER:**     IDEM/100/29/358/002/2001

**DOCUMENT DATE:**                     March 2, 2001

**REPORT TITLE (In Citation Format):**

Buening, Julie, K. 2001   Water Quality Assessment for the Development of Total Maximum  
Daily Loads for Copper and Oil & Grease in Crawford Ditch in Elkhart County.

**SIGNATURE(s):**

**Author: Julie Buening** \_\_\_\_\_ **Date:** \_\_\_\_\_

**QA OFFICER:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**PROGRAM MANAGER:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**SECTION CHIEF:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**BRANCH CHIEF:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**INITIAL NUMBER OF REPORT COPIES PRINTED:** \_\_\_\_\_

**INITIAL DISTRIBUTION LIST: (Attached)**



IDEM/100/29/358/002/2001

# **Water Quality Assessment for the Development of Total Maximum Daily Loads for Copper and Oil & Grease in Crawford Ditch in Elkhart County**

**By Julie Buening**

Environmental Scientist

Environmental Toxicology and Chemistry Section

Assessment Branch, Office of Water Quality

(317) 308-3092

[jbuening@dem.state.in.us](mailto:jbuening@dem.state.in.us)

**Indiana Department of Environmental Management**

100 N. Senate Avenue

P.O. Box 6015

Indianapolis, IN 46206-6015

**March 2, 2001**

## INTRODUCTION

Crawford Ditch begins at the Conrail Superfund site in northwestern Elkhart County, and flows north to the St. Joseph River. The stream is less than one mile in length. At its confluence with the St. Joseph River, Crawford Ditch is estimated to have a drainage area of about one square mile. The 7Q10 low-flow for Crawford Ditch is zero.

Section 303(d) of the Clean Water Act requires; states to develop lists of impaired waters needing total maximum daily loads, establish priorities for their development according to the severity of the pollution, and determine the uses to be made of the waters. IDEM Segment Survey sampling in July 1991 indicated total, copper concentrations exceeded chronic aquatic life water quality criteria at one sampling site on Crawford Ditch. An oily sheen and oil-saturated sediment were also observed near the Conrail Superfund site. These identified water quality problems were included on the Office of Water Management's 1998 303(d) list of impaired waterbodies. Crawford Ditch is in the Great Lakes Basin area and since 1997, under the Great Lakes Initiative (GLI), has applicable water quality standards as dissolved for copper and other metals.

## METHODS

### Sampling Sites and Locations

An initial water quality assessment consisted of 3 sites: one north of the Conrail Superfund site on Old US Highway 33, one near Valerie Lane, and one unnamed tributary to Crawford Ditch, also near Valerie Lane (Figure 1). Three sampling events were conducted between July 18 and November 2, 2000. Water samples were collected at the sites listed below during each event from 9:00 a.m. to 3:00 p.m.

Site #	Stream Name	Location	Latitude Longitude
LMJ220-0005	Crawford Ditch	Valerie Lane	N 41° 40' 30.27" W 86° 01' 58.43"
LMJ220-0007	Unnamed Tributary to Crawford Ditch	Valerie Lane	N 41° 40' 30.11" W 86° 01' 54.67"
LMJ220-0008	Crawford Ditch	North of old US Highway 33	N 41° 40' 1.39" W 86° 01' 55.93"

### Sample Collection

The surface water locations were sampled three times for dissolved copper, hardness, and oil & grease. For copper, the Water Quality Standards (WQS) depend on instream hardness, and shall not exceed a value equal to  $e^{(0.8545 \ln(\text{hardness}) - 1.702) * 0.96}$  ug/L. Using the 339 mg/L hardness value recorded for Crawford Ditch on September 20, 2000, this is about 25 ug/L. For oil & grease, although there are visual standards, there are no numeric water quality standards. Region 3 uses an oil & grease numeric standard of 10 mg/L. Concentrations of **oil & grease less than 10 mg/L** will be considered as meeting water

quality criteria. All the water samples were sent to the Indiana State Department of Health (ISDH) for chemical analysis for oil & grease and dissolved copper. Duplicates and field blanks were also collected for Quality Assurance/Quality Control (QA/QC). Specific information about measurement of water hardness, metals, and oil & grease is listed below.

Parameter	Preservative	CRQL	Units	Container Type	Holding
Hardness (as CaCO <sub>3</sub> )	HNO <sub>3</sub>	1.0	mg/L	1 L, plastic, narrow mouth	28 days
Metals, Dissolved	HNO <sub>3</sub> < pH 2 (field filtered)	4	ug/L	1 L, plastic, narrow mouth	6 months
Metals (GFAA/ICP)	HNO <sub>3</sub> < pH 2	4	ug/L	1 L, plastic, narrow mouth	6 months
Oil and Grease	H <sub>2</sub> SO <sub>4</sub> < pH 2	4	mg/L	1 L, glass, narrow mouth	28 days

### Protocol Deviations

There were two deviations from the work plan. The first change occurred during the second and third sampling events. Site LMJ220-0007, the Unnamed Tributary to Crawford Ditch, was not sampled because it was dry. The second change was due to scheduling constraints. The third sampling event occurred after October 31<sup>st</sup>. Oil & grease and copper standards are not dependent on water temperature so the later sampling date did not affect the study.

## RESULTS

### Copper

The copper results from each sampling event and the WQS for copper are listed in (Table 1). The dissolved copper results from the first, second, and third sampling events at measured water hardness did not show any WQS violations.

### Oil & Grease

The oil & grease results from the first and second sampling events for data quality reasons were rejected because the sample test results were found to be less than five times the field blank results. The oil & grease results from the third sampling event were below the numeric standard of 10 mg/L for oil & grease. The oil & grease results from each sampling event are listed in (Table 2).

### Field Measurements

In conjunction with the water sampling at each site, standard field parameter measurements were taken using the YSI™ multi-parameter water-chemistry analysis unit. These

parameters include pH, dissolved oxygen (DO), turbidity, percent saturation, specific conductivity, water temperature, chloride, and chlorophyll (Table 3). Weather conditions and field observations made at each sampling site were also noted on the IDEM "Stream Sampling Field Sheet".

### **Field Observations**

During the first sampling event, algae was found at the Unnamed Tributary to Crawford Ditch and the water appeared yellow at the site north of old US Highway 33. An oily sheen was observed on the second sampling event at the site north of old US Highway 33. During the third sampling event, algae was found at the site near Valerie Lane, (Figure 2)

### **DISCUSSION**

No WQS violations were found for dissolved copper on either of the sampling sites during the first, second, and third sampling events.

The results for the oil and grease parameters from the first and second sampling events for data quality reasons were rejected because the sample test results were found to be less than five times the result of the field blank. The oil & grease results from the third sampling event ranged between 4 and 8 mg/L and showed no WQS violations for oil & grease.

### **RECOMMENDATIONS**

Due to the low levels of oil & grease in Crawford Ditch that were below the water quality standards (10 mg/L) and since there were no violations of water quality standards (WQS) for copper, the following recommendations are being proposed for Crawford Ditch.

1. Delist Crawford Ditch for copper. The dissolved copper results from all three sampling events were below the WQS, indicating that Crawford Ditch is not impaired for copper.
2. Sample Crawford Ditch, if necessary, for oil & grease, even though oil & grease results from one or more sampling events were not in violation of the WQS.
3. Additional oil & grease valid data needs to be collected and analyzed to determine if the algae observed in Crawford Ditch is actually causing the oily sheen appearance in the stream.

**Table 1**  
**Dissolved Copper Results**

<u>Site</u>	<u>Site Description</u>	<u>Site #</u>	<u>IDEM #</u>	Date Sampled	<u>Dissolved Copper</u>	<u>Hardness</u>	<u>WQS</u> (mg/L)	<u>WQS</u> <u>Violations</u>
-------------	-------------------------	---------------	---------------	-----------------	-----------------------------	-----------------	----------------------	---------------------------------

**Sampling Event -- 1**

Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA00708	07/18/2000	3	332	25	No
Unnamed Tributary to Crawford Ditch	Near Valerie Lane	LMJ220-0007	AA00710	07/18/2000	3	310	24	No
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA00711	07/18/2000	16	291	22	No

**Sampling Event -- 2**

Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA01920	09/20/2000	3	339	25	No
Unnamed Tributary to Crawford Ditch	Near Valerie Lane	LMJ220-0007	—	—	No results because the site was dry.			
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA01938	09/20/2000	13	241	19	No

**Sampling Event -- 3**

Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA03026	11/02/2000	3	306	23	No
Unnamed Tributary to Crawford Ditch	Near Valerie Lane	LMJ220-0007	—	—	No results because the site was dry.			
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA03029	11/02/2000	4.4	271	21	No

**Table 2**  
**Oil & Grease Results from Sampling Events 1– 3\***

<u>Site</u>	<u>Site Description</u>	<u>Site #</u>	<u>IDEM #</u>	<u>Date Sampled</u>	<u>Oil &amp; Grease</u>	<u>WQS</u> (mg/L)	<u>WQS Violations</u>
<b>Sampling Event – 3</b>							
Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA03026	11/02/2000	4	10	No
Tributary to Crawford Ditch	North of Old US Highway 33	LMJ220-0007	—	—	No results because the site was dry.		
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA03029	11/02/2000	8	10	No
<b>Sampling Event – 1</b>				<b><u>Rejected Data</u></b>			
Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA00708	7/18/2000	12*	10	—
Tributary to Crawford Ditch	North of Old US Highway 33	LMJ220-0007	AA00710	7/18/2000	13*	10	—
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA00711	7/18/2000	12*	10	—
<b>Sampling Event – 2</b>							
Crawford Ditch	Near Valerie Lane	LMJ220-0005	AA01920	9/20/2000	10*	10	—
Tributary to Crawford Ditch	North of Old US Highway 33	LMJ220-0007	—	—	No results because the site was dry.		
Crawford Ditch	North of Old US Highway 33	LMJ220-0008	AA01938	9/20/2000	12*	10	—

\*Data from first and second sampling events for data quality reasons were not acceptable and rejected. (See QA/QC Review Reports in Attachment C.)



**Table 3**  
**Crawford Ditch Field Measurements Data**

Site Description	Site #	IDEM #	Date Sampled	Dissolved Oxygen	pH	Water Temp (°C)	Specific Conductivity	Turbidity	% Saturation	Chloride	Chlorophyll
------------------	--------	--------	--------------	------------------	----	-----------------	-----------------------	-----------	--------------	----------	-------------

**Sampling Event -- 1**

Valerie Lane	LMJ220-0005	AA00708	7/18/2000	8.28	7.82	21.18	803	6.3	93.9	96.03	3.0
Unnamed Trib to Crawford Ditch	LMJ220-0007	AA00710	7/18/2000	7.27	7.74	22.19	599	1.0	84	49	3
N of old US Highway 33	LMJ220-0008	AA00711	7/18/2000	7.46	7.5	22.54	1039	18.5	87.4	212.7	54.9

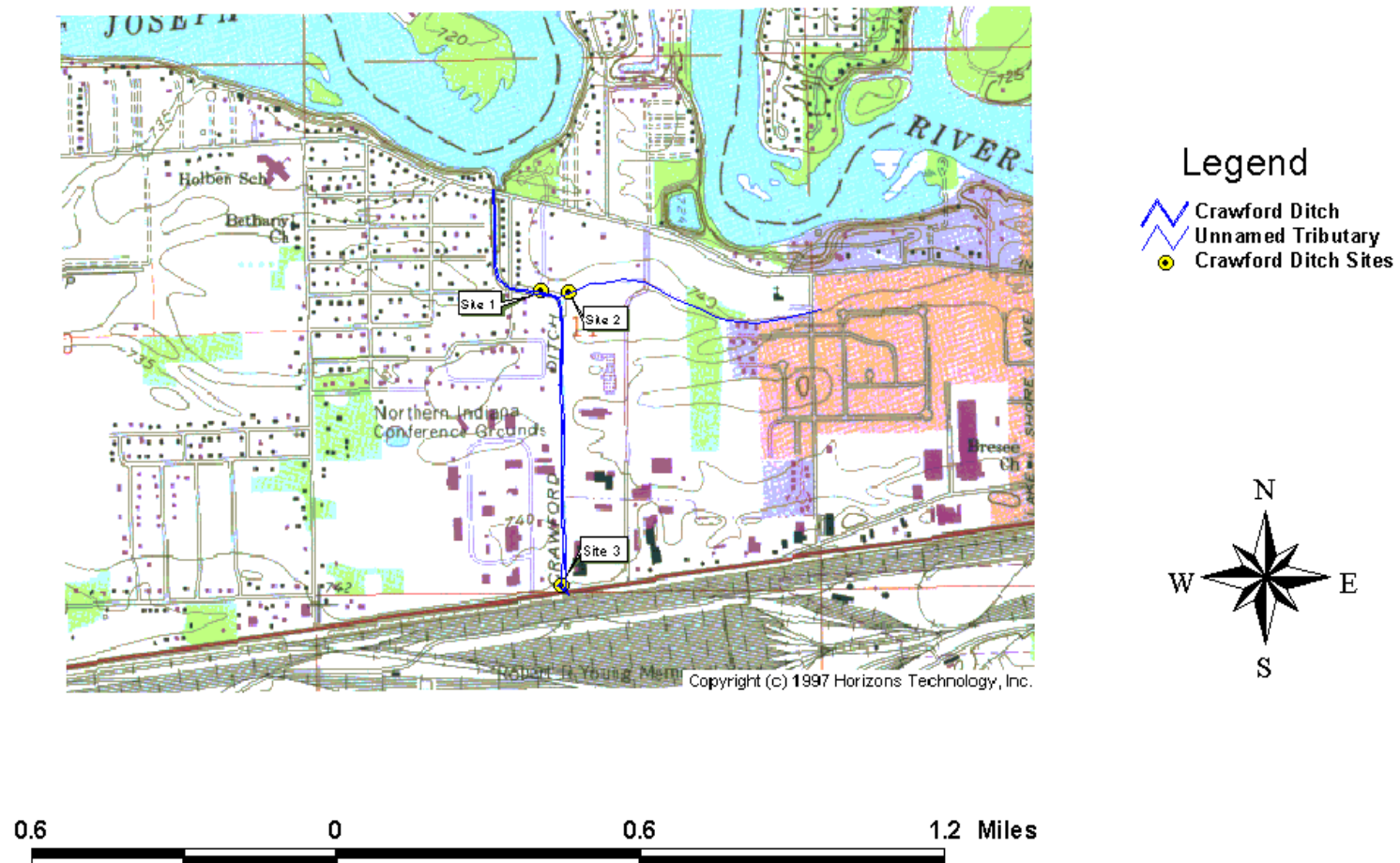
**Sampling Event – 2**

Valerie Lane	LMJ220-0005	AA01920	9/20/2000	7.84	7.71	18.47	1446	5.9	84.7	81.15	6.6
Unnamed Trib to Crawford Ditch	LMJ220-0007	—	—	No results because the site was dry.							
N of old US Highway 33	LMJ220-0008	AA01938	9/20/2000	7.05	7.4	20.64	1943	15.8	79.1	197	69.9

**Sampling Event – 3**

Valerie Lane	LMJ220-0005	AA03026	11/2/2000	7.94	7.75	12.97	1354	5.4	76.3	87.6	2.9
Unnamed Trib to Crawford Ditch	LMJ220-0007	—	—	No results because the site was dry.							
N of old US Highway 33	LMJ220-0008	AA03029	11/2/2000	9.6	8.06	13.11	1502	13.9	92.9	165.3	166.1

**Figure 1**  
**Site Map of Crawford Ditch**



**Figure 2**  
**Picture of Algae-Laden Bucket**

